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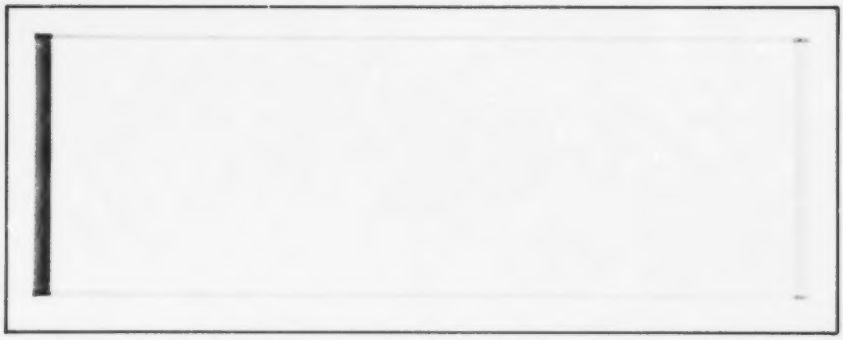

WORKING PAPER

Marketing and Economics Branch

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Working papers are (1) interim reports completed by the staff of the Marketing & Economics Branch, and (2) research reports completed under contract. The former reports have received limited review, and are circulated for discussion and comment. Views expressed in these papers are those of the author(s) and do not necessarily represent those of Agriculture Canada.

A SYSTEMS APPROACH TO ESTIMATING PRAIRIE CROP ACREAGE

Working Paper 15/85

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1 - INTRODUCTION

A number of studies have been reported (1,3,4,5,6,7 and 8) which examine the nature of supply response for a variety of crops in Canada. Most of these test farmers' production or planting decisions in a partial manner estimating response functions separately for the individual crops. While useful for some purposes, studies using this approach are limited because they ignore the fact that production decisions for crops are part of a joint decision process. Such studies don't take into consideration that in the short run the land base for crops is constrained although there may be some response to economic stimuli in the longer run.

Recently, two studies have been reported which attempt to deal with these shortcomings. They separate the decision process into two components. The first component focuses on the decision of how many acres to plant to all crops. The second decision concerns how to allocate the total planted acreage determined in the first stage among the various crops. Shiau et al. (9) estimated independent acreage equations for all but one crop. They then determined the estimated acreage of the final crop as a residual from the identity. The major problem with their approach is that there is nothing to prevent the estimate of the residual crop acreage from being negative. To avoid such a potential problem Colman (2) used a multinomial logit model which estimates the ratios of individual crop acreages to the acreage of an arbitrarily selected "base crop". An identity constrains the sum of crop acreages to equal the total land planted. Both studies used separate equations to estimate total acreage planted and summerfallow. Since it is often easier to forecast changes in total planted acreage than changes in individual crop acreages, both approaches fit well into a forecasting procedure where estimated total

planted acreage is supplied either by a separate equation or by an exogenous source. But the latter approach is considerably more attractive since the joint nature of crop planting decisions is explicitly incorporated in the modelling framework.

The study reported here focuses on the allocation of total planted acreage amongst summerfallow and the seven major crops in the prairie region, namely: bread wheat, durum wheat, oats, barley, flaxseed, canola and rye. The model used is similar in its essentials to Colman's but includes more crops. The model is used to conduct a cursory examination is then made with regard whether producers respond in their planting decisions to the announced initial price for the new crop year, the current initial price, or a mixture of the two and whether the most recently received Canadian Wheat Board (CWB) final payment plays a rcle in their decision-making process. In an earlier study, Meilke (5) analyzed the responsiveness of plantings of wheat, oats and barley in the prairies to the division of producer grain revenues between initial and final payments. He concluded that Canadian Wheat Board (CWB) initial and final payments could be manipulated to influence plantings.

2 - THE THEORETICAL MODEL

Consider a system of n acreage demand equations

(1) $A(i) = ef(i) \qquad i = 1...n$

(2) where $f(i) = bi.0 + bi.1*r + bi.2*Z(i)$

and A(i) is the acreage of the i^{th} crop,
r is the implicit rental price of land,
Z(i) is an exogenous variable, and
bi.k are parameters for k = 0 to 2.

By definition

$$(3) \qquad \sum_{i=1}^{n} A(i) = A(T)$$

where A(T) is total acreage planted.

Solving for the implicit rental price of land:

(4) $r = g(A(T), Z(1) \ldots\ldots Z(N))$ or
$= g(A(T), Z)$

where $Z = (Z(1) \ldots\ldots Z(N))$,

and substituting this expression into (2) yields

(5) $f(i) = bi.0 + bi.1*g(A(T),Z) + bi.2*Z(i)$.

Assuming that the elasticity of demand for land is identical for all crops then bi.1 = b1 for all i=1....n, and the log of the ratio of any two crop acreages can be written as

(6) $\log (A(i)/A(B)) = ci.0 + bi.2*Z(i) - bB.2*Z(B)$

where B denote an arbitrarily selected crop and

$ci. = bi.0 - bB.0$

Consequently estimates for all the parameters in the system can be obtained by estimating n-1 equations having the form of equation (6).

Moreover, one can show[1] that the acreage elasticity for any crop with respect to any arbitrary Z(k) can be written as

$$(7)\quad \frac{dW(i)}{dZ(k)}\frac{*Z(k)}{W(i)} = \frac{dA(i)}{dZ(k)}\frac{*Z(k)}{A(i)} = Z(k)\left(\frac{df(i)}{dZ(k)} - \sum_{j=1}^{n} W(j)*\frac{df(j)}{dZ(k)}\right)$$

$$\text{where } W(i) = A(i)/\sum_{j=1}^{n} A(j)$$

When Z(k) appears in only one f(j), equation (7) reduces to:

$$(8)\quad \frac{dA(i)}{dZ(k)}\frac{*Z(k)}{A(i)} = Z(k)\frac{*df(i)}{dZ(k)}*(1-w(i)) \qquad \text{for } i = j$$

$$= -Z(k)\frac{*df(i)}{dZ(k)}*W(i) \qquad \text{for } i \neq j$$

Therefore, when Z(k) appears in only one of the f(j), the elasticities acreage of all other crops with respect to that variable will be identical. When an exogenous variable appears in more than one of the f(i) one of which is f(B), one cannot uniquely identify the individual parameters only the difference between the two parameters. Nevertheless all of the required elasticities can still be calculated. Note that given no change in relative crop shares, the elasticity formula will produce elasticities that vary in time in direct proportion to changes in the size of the explanatory variables.

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[1] A derivation of this formula is contained in Appendix 1.

3. - THE EMPIRICAL MODEL

The individual crop specifications or f(i)'s rest on the premise that most planting decisions are made in the quarter prior to planting. For all crops except rye this is the first quarter of the calendar year. For rye it is assumed that the bulk of the planting decisions are made in the second quarter of the calendar year since fall rye predominates over spring rye. Crop prices, cost of production, farm inventories, and quota restrictions are assumed to be the major factors influencing crop allocation.

Because by far the largest portion of wheat is marketed through the Canadian Wheat Board (CWB), the CWB prices are hypothesized to be the most influential in determining bread and durum wheat acreages. Two such prices are included for each type of wheat. The first is the most recent final payment announced by the CWB. This payment would be for the crop year two years prior to that for which the planting is being done. For example, for 1981 plantings the final payments for 1979/80, which was announced in January of 1981, would be of critical concern. The second is the initial price paid by the Canadian Wheat Board. Currently this price is generally announced in March to take effect at the beginning of the crop year. In the model the initial price paid to producers in the third quarter is used which averages one month from the old crop year and two months from the new crop year. This formulation, for example, assumes that in 1980/81 producers anticipated most but not all of the upward adjustment of the initial price and in 1981/82 they anticipated some of the reduction in the initial price which was not announced until after planting was complete.

Because of the apparent similarity of our specification of the supply inducing price of wheat with that of Meilke's, it is perhaps useful to compare them. Under Meilke's specificaton both the initial and final payments correspond to the crop year which is in effect when

the crop is planted and not when the crop will be marketed. Thus, the acreage of the crop planted in year t would be influenced by initial and final payments for crop year t-1. Given the current enconomic setting Meilke's specification is less than satisfactory for two reasons. First, in light of the early announcement of initial price levels, it would seem reasonable to assume that producers would use this information in making planting decisions. Second, at the time when producers must plant the crop in year t, the final payment for crop year t-1 is not known and will not normally be known for another 9 months. It is unlikely that producers can accurately forecast the size of the final payment this far in advance. In our model the producer's expectations of prices depend in most years only on known information - the initial price currently being paid, the initial price to be paid in the next crop year and the last announced final payment.

Transportation and handling costs were subtracted from the initial prices for bread and durum wheat to express them in farm gate terms. For all but the final year in the estimation period, the transportation rate used, was $5.09, i.e. the crow rate between Scott, Saskatchewan and Thunder Bay. For 1983, and subsequent years the transportation rate selected was that applicable to the crop year for which the producers were planting. In contrast, the handling costs selected were those currently in effect at the time of planting because unlike transportation costs, handling costs are not known in advance. Handling costs were calculated as a weighted average of Manitoba Pool Elevator, Saskatchewan Wheat Pool and Alberta Wheat Pool primary elevator tariffs.

The off-Board market is more important for coarse grains then it is for wheat, and consequently must be considered in producers' acreage determination processes. Accordingly, weighted averages of prices received by farmers for off-Board deliveries in the Prairies to agents licensed to collect levies for the Western Grain

Stabilization program were used. In the oats specification the first quarter observation of the Prairie off-Board price was used as the supply inducing price. In the barley specification the CWB and off-Board markets were assumed to be of equal significance. A simple average of the Prairie off-Board price in the first quarter and the CWB initial price in the third quarter was therefore taken. The CWB initial price of barley was backed into the Prairies in a manner similar as that used for wheat. Although the CWB final payment for barley was originally in the specification, it was removed when it was found to be negative and statistically insignificant.

For the commodities that are not under the CWB jurisdiction, average farm prices collected for the Western Grain Stabilization program in a manner similar to that for the off-Board prices, were used as the supply inducing prices. The farm price in the first quarter was used for the flaxseed and canola specifications and the farm price in the second quarter for the rye specification.

Crude measures of the cost of production were derived for the individual crops by dividing total Canadian farm operating expenses for crop production in the previous calendar year by the total area in Western Canada seeded to the major grains and oilseeds in the previous crop year, and then deflating the resulting quotient by the three year moving average yield for the particular crop. Major categories of expenses included in the crop production costs were total machinery, fertilizer and lime, pesticides, seed, irrigation, custom work, insurance and stabilization levies. The weakness of these proxies, however, is that they assume equal costs on a per acre basis for each crop. Consequently, these proxies can only pick up part of the cost differential between producing the various crops.

It was hypothesized that hog inventories stimulate barley production. Since many prairie hog producers do not purchase barley for hog feeding, their barley plantings are influenced by the expected feed needs on their farms.

The Lower Inventories for Tomorrow (LIFT) Program was thought to have affected acreage allocation in 1970 and also in 1971. A binary proxy was used to account for the impacts of this program.

Finally persistent shifts of acreage over time were accomodated by including a trend variable in the bread wheat, oats and summerfallow specifications. Causes of these shifts would include differences in the rate of increases in crop yields and increased acceptance by producers of new crops - particularly rapeseed.

Denoting bread wheat, durum wheat, oats, barley, canola, flaxseed, rye and summerfallow by W, D, O, B, C, F, R and S respectively, the acreage specifications were as follows:[2,3]

(9) $f(W) = AW.0 + AW.1*XFPBWH1(t-2) + AW.2*(XIPBWH1(Q3,t-1) - HCWH3(t-1) - CROW(t)) + AW.3*FMBWH1(Q4+Q1, t-1) + AW.4*COST(t-1)/YBWH1(t-1, t-2, t-3) + AW.5*TREND(t) + AW.6*DLIFT(t)$

(10) $f(D) = AD.0 + AD.1*XFPDWH1(t-2) + AD.2* (XIPDWH1(Q3,t-1) - HCWH3(t-1) - CROW(t)) + AD.3*FMDWH1(Q4+Q1, t-1) + AD.4*FIDWH1(t-1) + A.5*COST(t-1)/YDWH1(t-1,t-2,t-3) + AD.6*DLIFT(t)$

(11) $f(O) = AO.0 + AO.1*OPOA1(Q1,t-1) + AO.2*FMOA1(Q4+Q1,t-1) + AO.3*COST(t-1)/YOA1(t-1\ t-2,t-3) + AO.4*TREND(t) + AO.5*DLIFT(t)$

(12) $f(B) = AB.0 + AB.1*(OPBA1(Q1,t-1) + (XIPBA1(Q3,t,t-1) - HCBA3(t-1) - CROW(t))/2 + AB.2*FMBA1(Q4+Q1,t-1) + AB.3*IHG1(Q1,t-1) + AB.4*COST(t-1)/YBA1(t-1,t-2,t-3)$

(13) $f(C) = AC.0 + AC.1*FPRA1(Q1,t-1) + AC.2*FMRA1(Q4+Q1,t-1) + AC.3*COST(t-1)/YRA3(t-1,t-2,t-3) + AC.4*DLIFT(t) + AC.5*DLIFT\ (t-1)$

(14) $f(F) = AF.0 + AF.1*FPFL1(Q1,t-1) + AF.2*FMFL1(Q4+Q1,t-1) + AF.3*FIFL1(t-1) + AF.4*COST(t-1)/YFL1(t-1,t-2,t-3) + AF.5*DLIFT(t)$

(15) $f(R) = AR.0 + AR.1*FPRY1(Q2,t-2) + AR.2*FIRY1(t-2) + AR.3*COST(t-1)/YRY1(t-1,t-2,t-3) + AR.4*DLIFT(t-1)$

(16) $f(S) = AS.0 + AS.1*COST(t-1) + AS.2*TREND(t) + AS.3*DLIFT(t)$

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[2]The variable definitions are presented in Appendix II and are similar to those currently used in the FARM model.

[3]Qrefers to the calendar quarter and t refers to the crop year

4 - ESTIMATION AND RESULTS

Using bread wheat acreage as the denominator, the set of crop acreage specifications in equations (9) through (16) were rewritten in the form of equation (6). For ease of exposition each of these new equations will be referred to by the crop in the numerator; for example, the equation explaining the durum wheat to bread wheat acreage ratio will be referred to simply as the durum equation. All the acreage equations were simultaneously estimated with a non-iterative generalized least squares procedure over the period 1968 to 1983. Table 1 contains the estimated coefficients and diagnostic statistics. Overall, the results are satisfactory. The signs of the estimated coefficients conform to prior expectations and all the explanatory variables, except for hog inventories in the barley equation and the trend variable in the oats equation, are significant. The goodness of fit of each of the equations seems to reflect the size of the crop being compared to the base or bread wheat acreage. In general the larger the crop the better the fit, and the smaller the crop the worse the fit. Contrary to this generalization a good fit was achieved for the oats equation despite oats relatively small acreage. This is probably due to the steady decline that has occurred in oats acreages over the estimation period. This constant decline has been captured by oats marketings as well as the trend variable. As oats acreage and, consequently, oats supply decrease in each period, oats marketings necessarily decrease, which in turn decrease acreage in the following period, causing a self-perpetuating decline.

TABLE 1. ESTIMATION RESULTS OF THE MULTINOMINAL LOGIT MODEL FOR WESTERN CANADIAN ACREAGES (1968-1983)

	Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Intercept		-1.8853	-0.8040	-0.7356	-2.9536	-2.1356	-2.3103	-0.6266
		(-12.38)	(-5.88)	(-6.16)	(-19.36)	(-12.67)	(-17.18)	(-3.00)
Net CWB initial price (Q3,t)*	0.0061	0.0082	0.0051					
	(8.05)	(6.33)	(15.98)					
CWB final payment (t-2)	0.0054	0.0030						
	(5.60)	(3.85)						
Off-board price (Q1, t-1)			0.0051	0.0066				
			(15.98)	(10.23)				
Farm price (Q1, t-1)						0.0018	0.0053	
						(6.11)	(14.98)	
Farm price (Q2, t-2)					0.0080			
					(3.75)			
Expected crop expenses (t-1)	-0.0234	-0.0275	-0.0383	-0.0299	-0.0233	-0.0125	-0.0175	-0.3715
	(-11.66)	(-10.33)	(-12.61)	(-13.02)	(-6.84)	(-10.37)	(-11.62)	(-11.22)
Marketings (Q4 + Q1, t-1)	0.0781	0.6803	0.2724	0.3524		0.5373	0.7274	
	(13.64)	(5.77)	(11.44)	(3.56)		(1.87)	(12.50)	
Closing farm inventories (t-1)		-0.4665			-0.3966	-2.0277		
		(-13.08)			(-1.54)	(-5.02)		
Closing hog inventories (Q1, t-1)			8.72 (E-07)					
			(0.04)					
Trend (t)	-0.0127			-0.0032				0.0825
	(1.76)			(-0.51)				
Lift program (t)	-0.7566	1.1170		0.7295		1.3213	1.1350	0.8199
	(19.35)	(8.90)		(14.08)		(11.48)	(12.76)	(14.08)
Lift program (t-1)					0.7453		0.3936	
					(8.30)		(5.92)	
R^2		0.6703	0.9736	0.9800	0.5386	0.8358	0.8536	0.9508
SSR		0.5295	0.0384	0.0711	0.7358	0.7525	0.8401	0.1081
DW		1.83	2.41	1.04	1.53	2.16	1.61	1.58

*Q refers to the calendar quarter and t refers to the crop year

5 - HISTORICAL SIMULATION

Using the estimated coefficients the model was historically simulated between 1968 and 1983. It was judged based on its ability to predict the acreage for the individual was as well as turning parts for these same acreages. Summary statistics are contained in Table 2. In terms of root mean square percentage errors and number of turning points missed, the model performs very well for bread wheat and barley. The performance for bread wheat is especially remarkable considering bread wheat acreage is determined residually in an identity during simulation. The model also performs rather well for summerfallow acreage with a root mean square percentage error of 5.6, but misses 40 percent of the turning points. This reflects the fact that the summerfallow equation is a very crude representation of the multi-period maximizing problem where solution yield summerfallow acreage. The model is least successful in reproducing flaxseed, canola and rye acreages according to the root mean square percentage errors and misses more than 25% of the turning points for each of them. This should be expected. The estimating technique chooses coefficients to minimize the sum of squared residuals of the system. In such a context, a one million acre error for wheat acreage is given the same weight as a one million acre error for flaxseed acreage, although the latter constitutes a much larger percentage error. It therefore is not surprising that the estimation procedure yields coefficients which produce forecasts which are proportionately less precise for crops with lower acreages. This could be connected by using a weighted last squares prcedure which would minize percentage rather than absolute errors.

TABLE 2. INTRA-SAMPLE SIMULATION RESULTS BETWEEN 1968 AND 1983 OF THE MULTINOMIAL LOGIT MODEL FOR WESTERN CANADIAN ACREAGES

	Mean	RMS error	RMS % error	Turning points missed
Bread wheat	21.68	0.85	3.8	1
Durum wheat	3.10	0.49	16.0	6
Barley	10.75	0.58	5.1	2
Oats	4.25	0.31	7.8	5
Rye	0.76	0.14	19.1	4
Flaxseed	1.58	0.34	22.2	4
Canola	4.09	0.67	20.3	3
Summerfallow	26.80	1.48	5.6	6

6 - CROP ACREAGE RESPONSE ELASTICITIES

Complete matrices of own and cross crop acreage response elasticities implied by the estimated coefficients were evaluated at the sample mean, at each period over the regression range and at 1984 using the formula given in equation 7. Tables 3 and 4 contain the sets of elasticities evaluated at the mean and 1983 respectively. The set of elasticities evaluated for 1984 are in Appendix III. The elasticities for most of the explanatory variables tend to increase with time; for example, the CWB initial price of wheat with respect to bread wheat acreage has an elasticity of 0.24 in 1968, an elasticity of 0.64 in 1983 and an elasticity of 0.46 at the mean. This temporal change in elasticity is partly due to the formula itself as discussed in an earlier section. It indicates that changes in relative crop acreage shares in Western Canada are insufficient over time to fully compensate for changes in the explanatory variables magnitudes.

In examining the individual price elasticities, it is useful to compare and contrast them to results obtained by other researchers. Table 5 presents a comparison of the price elasticities calculated at the mean and 1983 with those calculated in other studies. Both Colman's wheat price elasticity of 0.56 and Meilke's short run elasticity of 0.53 are mid-range of our estimates for bread wheat of 0.46 and 0.64. Durum wheat with elasticities of 0.87 and 1.31 appears to be much more price responsive than bread wheat. The barley cross price elasticities of -0.10 and -0.12 for both bread and durum wheat acreage are much lower than Meilke's -0.69.

According to the estimated elasticities as cost of production increases producers will switch to bread wheat and flaxseed away from the other crops. This may indicate that either these crops

TABLE 3. WESTERN CANADIAN CROP ACREAGE RESPONSE ELASTICITIES EVALUATED AT THE MEAN

		Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Supply inducing prices									
Wheat:	CWB initial (Q3,t t-1	0.4597	-0.1937	-0.1937	-0.1937	-0.1937	-0.1937	-0.1937	-0.1937
	CWB final payment (t-2)	0.0612	-0.0258	-0.0258	-0.0258	-0.0258	-0.0258	-0.0258	-0.0258
Durum:	CWB initial (Q3,t)	-0.0380	0.8656	-0.0380	-0.0380	-0.0380	-0.0380	-0.0380	-0.0380
	CWB final payment (t-2)	-0.0032	0.0723	-0.0032	-0.0032	-0.0032	-0.0032	-0.0032	-0.0032
Barley:	CWB initial (Q3,t t-1)	-0.0564	-0.0564	0.3273	-0.0564	-0.0564	-0.0564	-0.0564	-0.0564
	Off-board (Q1,t-1)	-0.0548	-0.0548	0.3177	-0.0548	-0.0548	-0.0548	-0.0548	-0.0548
Oats:	Off-board (Q1,t-1)	-0.0264	-0.0264	-0.0264	0.4251	-0.0264	-0.0264	-0.0264	-0.0264
Rye:	Farm (Q2,t-2)	-0.0065	-0.0065	-0.0065	-0.0065	0.6174	-0.0065	-0.0065	-0.0065
Flaxseed:	Farm (Q1,t-1)	-0.0089	-0.0089	-0.0089	-0.0089	-0.0089	0.3991	-0.0089	-0.0089
Canola:	Farm Q1,t-1)	-0.0615	-0.0615	-0.0615	-0.0615	-0.0615	-0.0615	1.0269	-0.0615
Handling costs									
Wheat (t-1)		-0.0126	-0.0192	0.0069	0.0069	0.0069	0.0069	0.0069	0.0069
Barley (t-1)		0.0030	0.0030	-0.0174	0.0030	0.0030	0.0030	0.0030	0.0030
Freight rate (t)		-0.0163	-0.0270	-0.0115	0.0149	0.0149	0.0149	0.0149	0.0149
Crop expenses /acre (t-1)		0.2143	-0.2256	-0.2991	-0.0574	-0.0936	0.0329	-0.1940	0.0123
Yields									
Wheat (t-1,t-2,t-3)		1.1939	-0.5030	-0.5030	-0.5030	-0.5030	-0.5030	-0.5030	-0.5030
Durum (t-1,t-2,t-3)		-0.0900	2.0469	-0.0900	-0.0900	-0.0900	-0.0900	-0.0900	-0.0900
Barley (t-1,t-2,t-3)		-0.3251	-0.3251	1.8853	-0.3251	-0.3251	-0.3251	-0.3251	-0.3251
Oats (t-1,t-2,t-3)		-0.1151	-0.1151	-0.1151	1.8535	-0.1151	-0.1151	-0.1151	-0.1151
Rye (t-1,t-2,t-3)		-0.0207	-0.0207	-0.0207	-0.0207	1.9841	-0.0207	-0.0207	-0.0207
Flaxseed (t-1,t-2,t-3)		-0.0411	-0.0411	-0.0411	-0.0411	-0.0411	1.8373	-0.0411	-0.0411
Canola (t-1,t-2,t-3)		-0.1189	-0.1189	-0.1189	-0.1189	-0.1189	-0.1189	1.9863	-0.1189
Marketings									
Wheat (Q4+Q1,t-1)		0.3181	-0.1340	-0.1340	-0.1340	-0.1340	-0.1340	-0.1340	-0.1340
Durum (Q4+Q1,t-1)		-0.0202	0.4607	-0.0202	-0.0202	-0.0202	-0.0202	-0.0202	-0.0202
Barley (Q4+Q1,t-1)		-0.0961	-0.0961	0.5571	-0.0961	-0.0961	-0.0961	-0.0961	-0.0961
Oats (Q4+Q1,t-1)		-0.0058	-0.0058	-0.0058	0.0927	-0.0058	-0.0058	-0.0058	-0.0058
Flaxseed (Q4+Q1,t-1)		-0.0028	-0.0028	-0.0028	-0.0028	-0.0028	0.1272	-0.0028	-0.0028
Canola (Q4+Q1,t-1)		-0.0314	-0.0314	-0.0314	-0.0314	-0.0314	-0.0314	0.5248	-0.0314
Closing farm inventories									
Durum (t-1)		0.0120	-0.2738	0.0120	0.0120	0.0120	0.0120	0.0120	0.0120
Rye (t-2)		0.0006	0.0006	0.0006	0.0006	-0.0567	0.0006	0.0006	0.0006
Flaxseed (t-1)		0.0035	0.0035	0.0035	0.0035	0.0035	-0.1548	0.0035	0.0035
Hog inventories (Q1,t-1)		-0.0004	-0.0004	0.0021	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
Trend (t)		-1.0341	-0.6986	-0.6986	-0.7829	-0.6986	-0.6986	-0.6986	1.4879

TABLE 4. WESTERN CANADIAN CROP ACREAGE RESPONSE ELASTICITIES EVALUATED AT THE 1983 CROP YEAR

		Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Supply inducing prices									
Wheat:	CWB initial (Q3,t)*	0.6357	-0.4103	-0.4103	-0.4103	-0.4103	-0.4103	-0.4103	-0.4103
	CWB final payment (t-2)	0.0818	-0.0528	-0.0528	-0.0528	-0.0528	-0.0528	-0.0528	-0.0528
Durum:	CWB initial (Q3,t)	-0.0638	1.3140	-0.0638	-0.0638	-0.0638	-0.0638	-0.0638	-0.0638
	CWB final payment (t-2)	-0.0035	0.0729	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
Barley:	CWB initial (Q3,t)	-0.0669	-0.0669	0.4478	-0.0669	-0.0669	-0.0669	-0.0669	-0.0669
	Off-board (Q1,t-1)	-0.0580	-0.0580	0.3879	-0.0580	-0.0580	-0.0580	-0.0580	-0.0580
Oats:	Off-board (Q1,t-1)	-0.0180	-0.0180	-0.0180	0.5027	-0.0180	-0.0180	-0.0180	-0.0180
Rye:	Farm (Q2,t-2)	-0.0153	-0.0153	-0.0153	-0.0153	1.1029	-0.0153	-0.0153	-0.0153
Flaxseed:	Farm (Q1,t-1)	-0.0062	-0.0062	-0.0062	-0.0062	-0.0062	0.4314	-0.0062	-0.0062
Canola:	Farm Q1,t-1)	-0.1088	-0.1088	-0.1088	-0.1088	-0.1088	-0.1088	1.3224	-0.1088
Handling costs									
Wheat (t-1)		-0.0209	-0.0340	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174
Barley (t-1)		0.0052	0.0052	-0.0347	0.0052	0.0052	0.0052	0.0052	0.0052
Freight rate (t)		-0.0147	-0.0264	-0.0095	0.0191	0.0191	0.0191	0.0191	0.0191
Crop expenses /acre (t-1)		0.4121	-0.3908	-0.3733	-0.0857	0.2257	0.2855	-0.0471	-0.3263
Yields									
Wheat (t-1,t-2,t-3)		1.8277	-1.1797	-1.1797	-1.1797	-1.1797	-1.1797	-1.1797	-1.1797
Durum (t-1,t-2,t-3)		-0.1764	3.6339	-0.1764	-0.1764	-0.1764	-0.1764	-0.1764	-0.1764
Barley (t-1,t-2,t-3)		-0.4931	-0.4931	3.2997	-0.4931	-0.4931	-0.4931	-0.4931	-0.4931
Oats (t-1,t-2,t-3)		-0.1215	-0.1215	-0.1215	3.3837	-0.1215	-0.1215	-0.1215	-0.1215
Rye (t-1,t-2,t-3)		-0.0438	-0.0438	-0.0438	-0.0438	3.1500	-0.0438	-0.0438	-0.0438
Flaxseed (t-1,t-2,t-3)		-0.0441	-0.0441	-0.0441	-0.0441	-0.0441	3.0898	-0.0441	-0.0441
Canola (t-1,t-2,t-3)		-0.2636	-0.2636	-0.2636	-0.2636	-0.2636	-0.2636	3.2029	-0.2636
Marketings									
Wheat (Q4+Q1,t-1)		0.3940	-0.2543	-0.2543	-0.2543	-0.2543	-0.2543	-0.2543	-0.2543
Durum (Q4+Q1,t-1)		-0.0384	0.7906	-0.0384	-0.0384	-0.0384	-0.0384	-0.0384	-0.0384
Barley (Q4+Q1,t-1)		-0.1205	-0.1205	0.8062	-0.1205	-0.1205	-0.1205	-0.1205	-0.1205
Oats (Q4+Q1,t-1)		-0.0020	-0.0020	-0.0020	0.0565	-0.0020	-0.0020	-0.0020	-0.0020
Flaxseed (Q4+Q1,t-1)		-0.0012	-0.0012	-0.0012	-0.0012	-0.0012	0.0858	-0.0012	-0.0012
Canola (Q4+Q1,t-1)		-0.0722	-0.0722	-0.0722	-0.0722	-0.0722	-0.0722	0.8769	-0.0722
Closing farm inventories									
Durum (t-1)		0.0032	-0.0650	0.0032	0.0032	0.0032	0.0032	0.0032	0.0032
Rye (t-2)		0.0006	0.0006	0.0006	0.0006	-0.0403	0.0006	0.0006	0.0006
Flaxseed (t-1)		0.0034	0.0034	0.0034	0.0034	0.0034	-0.2399	0.0034	0.0034
Hog inventories (Q1,t-1)		-0.0003	-0.0003	0.0023	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
Trend (t)		-1.0797	-0.6492	-0.6492	-0.7573	-0.6492	-0.6492	-0.6492	2.1561

*Q refers to the calendar quarter and t refers to the crop year

TABLE 5. COMPARISON OF ESTIMATED ELASTICITIES - SELECTED SOURCES

	Lowe & Petrie	Meilke	Colman[a]	This Study Mean	This Study 1983
Wheat					
Wheat price	2.08	.53[a], 1.01[b]	.562	.460 , .866[c]	.636 , 1.314[c]
Barley price	-1.19	-.69[a], -1.32[b]	N.E.	-.104 , -.104[c]	.116 , -.116[c]
Oat price	N.E.	N.E.	N.E.	-.026 , -.026[c]	.018 , -.018[c]
Barley					
Wheat price	N.E.	-1.65 , -2.95	N.E.	- .194	-.410
Barley price	.236	1.50 , 2.68	.867	.605	.776
Oat price	N.E.	N.E.	N.E.	- .026	-.018
Oats					
Wheat price	N.E.	-.65 , -1.81	N.E.	-.194	-.410
Barley price	N.E.	N.E.	N.E.	-.104	-.116
Oat price	-.003	.78 , 2.17	.266	.425	.503
Canola					
Wheat price	N.E.	N.E.	N.E.	-.194	-.410
Barley price	N.E.	N.E.	N.E.	-.104	-.116
Canola price	.826	N.E.	.555	1.027	1.322
Flaxseed					
Wheat price	N.E.	N.E.	N.E.	-.194	-.410
Flaxseed pric	-.05	N.E.	.564	.399	.431
Rye					
Wheat price	N.E.	N.E.	N.E.	-.194	-.410
Rye price	N.E.	N.E.	N.E.	.617	1.103

[a]Colman presents only elasticities from single equation models
[b]Long and short run elasticities calculated from a Nerlovian model
[c]Elasticities for bread and durum wheat respectively

N.E. = Not estimated

are less expensive to grow or that producers regard them as safe bets, which bring in a guaranteed income. It is interesting to note that the elasticities of crop expenses per acre with respect to rye and summerfallow change signs between the mean and the 1983 calculation. The positive sign for summerfallow and the negative sign for rye at the mean are those expected a priori.

ONE-STEP AHEAD FORECASTS BASED ON ELASTICITIES

The strength of the elasticities calculated at the mean, and at each interval over the estimation range was tested by comparing one step ahead forecasts based on these elasticities with historical simulation results. The one step ahead forecasts were estimated in three stages. In the first step the change in acreage share of each crop was estimated by summing the products of the elasticities and the percentage changes of the appropriate explanatory variables. In the second step the acreage share of each crop was estimated by adjusting its acreage share in the previous period with the percent change in acreage share calculated in step 1. In the third step the acreage forecast was obtained by multiplying the acreage share of each crop estimated in step 2 by actual total acreage. Note because there is no constraint in stage 2 that the acreage shares must sum to one, the acreage forecasts estimated in stage 3 may not sum to the actual total acreage. However, the difference should be small. Examples of this procedure applied to 1984 and 1985 acreages using elasticities calculated at the mean and for the immediately proceeding period, respectively, are contained in Appendix IV.

Table 6 presents a comparision between the intra-sample simulation and the one-step ahead forecast results over the period 1972 to 1983. This period was purposely chosen to exclude crop years 1970 and 1971 because it is impossible to calculate elasticities for the binary variable for the LIFT program. In 1970 the LIFT policy caused aberrations in the supply response from what would be normally associated with the changes in the explanatory variables. These acreage distortions in 1970 would be carried forward into 1971 the one step ahead forecasts since the acreage shares in 1970 are input into the 1971 step ahead forecasts

In terms of RMS percent error, the simulation results of the multionomial logit model had greater accuracy in reproducing the historical acreages of all crops except flaxseed than did the one step ahead forecasts. However, in terms of turning points missed the one step ahead forecasts using elasticities evaluated at the mean did

TABLE 6. COMPARISON OF INTRA-SAMPLE SIMULATION RESULTS OF THE MULTINOMINAL LOGIT MODEL FOR WESTERN CANADIAN ACREAGES BETWEEN 1972 AND 1983 WITH ONE-STEP AHEAD FORECAST RESULTS USING VARIOUS EVALUATED ELASTICITIES FROM THE MODEL

		Method A			Method B			Method C		
Acreage	Mean value	RMS error	RMS % error	Turning points missed	RMS error	RMS % error	Turning points missed*	RMS error	RMS % error	Turning points missed*
Bread wheat	22.79	0.92	4.2	1	1.59	6.6	4	1.26	5.2	3
Durum wheat	3.20	0.52	15.8	4	3.88	122.1	2	0.79	25.0	4
Barley	10.94	0.55	4.8	1	0.84	7.4	1	0.63	5.4	1
Oats	3.87	0.33	8.7	4	0.37	9.9	2	0.44	10.3	3
Rye	0.75	0.14	20.6	3	0.22	30.3	5	0.21	28.1	3
Flaxseed	1.39	0.33	21.5	4	0.40	28.0	1	0.47	3.3	3
Canola	4.48	0.67	18.7	3	1.11	31.7	4	1.08	25.9	3
Summerfallow	25.81	1.48	5.8	6	3.18	11.9	6	2.04	7.9	7
Total	73.24	0.00	0.0	-	1.49	2.0	-	0.00	0.0	-

*Turning points missed for the one-step ahead forecasts can be calculated with either the share or acreage forecasts. The numbers reported here are based on the share forecasts. It is interesting to note that the number of turning points missed increase if they are based on the acreage forecasts.

where: Method A: Historical simulation results
Method B: One-step ahead forecasts using elasticities evaluated at the mean
Method C: One-step ahead forecasts using elasticities evaluated for the previous crop year

TABLE 7. CROP YEAR 1984 AND 1985 ACREAGE FORECASTS FROM POST-SAMPLE SIMULATION RESULTS OF THE MULTINOMINAL LOGIT MODEL FOR WESTERN CANADIAN ACREAGES AND FROM ONE-STEP AHEAD FORECAST RESULTS USING VARIOUS ELASTICITIES EVALUATED FROM THE MODEL

	Crop year 1984				1985 Seeding	Crop year 1985		
Acreage	Actual	Method A	Method B	Method C	Intentions	Method A	Method B	Method C
Bread wheat	27.66	25.32	26.49	25.79	28.82	29.41	29.05	30.49
Durum wheat	4.2	5.37	3.75	4.28	4.25	3.13	3.41	2.12
Barley	10.35	11.21	11.02	11.23	11.99	8.08	8.02	7.03
Oats	2.68	2.50	2.87	2.80	4.04	2.84	2.79	2.99
Rye	0.82	0.65	0.78	0.64	1.04	0.92	0.99	1.08
Flaxseed	1.74	1.75	1.47	1.62	1.60	2.05	1.25	1.97
Canola	7.29	9.81	8.38	9.39	6.43	5.92	6.19	5.60
Summerfallow	20.60	18.79	20.40	19.60	19.85	23.48	22.93	24.66
Total	75.40	75.40	75.16	75.35		75.82	74.63	75.94

where: Method A: Forecast simulation results
Method B: One-step ahead forecasts using elasticities evaluated at the mean
Method C: One-step ahead forecasts using elasticities evaluated for the previous crop year

equally well as the simulation results. It is interesting to note that for durum the former method gave a RMS percent error of 122, five times larger than the percent error associated with the other two methods, but missed only half the number of turning points as they did. Although there is no constraint on the one step ahead forecasts that they must sum to total acreage, there is negligible difference between the two for those forecasts using elasticities evaluated at the previous period, and only a 2 percent error for those forecasts using elasticities evaluated at the mean.

Table 7 compares the 1984 and 1985 acreage forecasts from the post-sample simulation results of the multinomial logit model with the one step ahead forecast results using elasticities evaluated at the mean and the immediately preceding year. The one-step ahead forecasts overall gave better estimates for the 1984 acreages than did the simulation results. Further, the one-step ahead forecasts using elasticities evaluated at the mean outperformed those using elasticities evaluated at the previous year. Initially, it was hypothesized that the reverse should hold true since the one step ahead forecasts using elasticities evaluated for the immediately preceding period should reflect any temporal structural change in responsiveness of acreages to the triggering variables. Unfortunately, however, besides reflecting changes in trend, they also reflect any aberration in behaviour that occurred in the previous period. Consequently in order to minimize the influence of these outlier observations but still capture changes in trend, elasticities evaluated at the previous three or five year average should probably have been used instead.

8. - CURRENT VERSUS ANNOUNCED INITIAL PRICES

To explore whether producers when forming their planting decisions respond to the announced initial price for the new crop year, the current initial price, or a mixture of the two as originally specified, the multinomial logit model was re-estimated substituting these initial prices for the third quarter initial price in the bread wheat, durum wheat and barley specifications. The resulting estimated coefficients for the model using the announced initial prices generally correspond in magnitude to those obtained using the third quarter price with a few exceptions. The time coefficients in both the wheat and oats equations and the farm inventories coefficient in the rye equation changed signs. The overall fit for the durum and canola specifications was notably worse. The resulting estimated coefficients for the model using the current initial prices in comparison to those for the model using the third quarter initial prices had larger marketing coefficients and smaller price coefficients. Most disturbing, the coefficient for the initial price of bread wheat changed signs. Again the overall fit for the canola specification was worse but the fit for the rye equation was improved. A summary of the R^2's for the different estimation results are presented in Table 8.

Table 9 contains a comparison of the intra-sample simulation results of the various models. In terms of RMS percent error, the mixture of the two initial prices gives the best performance for bread wheat, oats and canola acreages, and not significantly worse results for durum and barley acreages than the other models. The announced initial prices, alone, do not increase the predictive performance for any of the crops.

9 - POLICY IMPLICATIONS

It has been suggested that under the Canadian Wheat Board system, the long delay before the market price (the CWB's final realized price) is revealed to producers causes supply response to be slowed and that Canadian producers may fail to take advantage of market opportunities as a consequence. Our results would indicate that such an effect is very small, if it exists at all. Since the influence of the last announced CWB final price on planted acreage is small for wheat and statistically not significant for barley, it would appear that the CWB payment system does not retard adjustments in planted acreages in response to changed market opportunities. In fact, one can conclude that the CWB payment system will yield more efficient planting decision if the initial price for wheat is a reasonably accurate forecast of the final realized price, than a system where producers respond to lagged market prices. To realize these efficiency gains however, it is necessary that initial price be set to reflect market opportunities.

TABLE 8. COMPARISON OF $R^{2's}$ BETWEEN THE MODELS USING THE CURRENT INITIAL PRICE, THE ANNOUNCED INITIAL PRICE AND A MIXTURE OF THE TWO

Acreage	1/3 Current Initial Price +2/3 Announced Initial Price	Announced Initial Price	Current Initial Price
Durum Wheat	.67033	.55596	.66264
Barley	.97356	.96170	.96190
Oats	.98001	.96680	.96628
Rye	.53863	.56818	.63616
Flaxseed	.83578	.83060	.83244
Canola	.85363	.75335	.76006
Summerfallow	.95078	.92429	.95633

TABLE 9. COMPARISON OF INTRA-SAMPLE SIMULATION RESULTS BETWEEN THE MODELS USING THE CURRENT INITIAL PRICE, THE ANNOUNCED INITIAL PRICE AND A MIXTURE OF THE TWO

ACREAGE	1/3 Current Initial Price +2/3 Announced Initial Price		Announced Initial price		Current Initial Price	
	RMS ERROR	RMS % ERROR	RMS ERROR	RMS % ERROR	RMS ERROR	RMS % ERROR
Bread wheat	8.54	3.84	11.36	5.03	11.07	5.13
Durum wheat	4.93	15.99	5.51	20.11	4.67	15.89
Barley	5.78	5.10	8.14	7.37	5.49	5.01
Oats	3.09	7.78	4.09	10.12	3.54	9.82
Rye	1.39	19.14	1.33	18.30	1.14	16.85
Flaxseed	3.41	22.19	3.10	20.32	3.06	20.44
Canola	6.68	20.31	7.49	28.84	7.11	27.95
Summerfallow	14.81	5.61	16.25	6.15	10.11	3.77

TABLE 10. ONE STEP AHEAD FORECASTS OF 1984 ACREAGES USING THE ELASTICITIES EVALUATED AT THE MEAN

Exogenous variable	% change	Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Wheat initial price	-0.9	-0.414	+0.174	+0.174	+0.174	+0.174	+0.174	+0.174	+0.174
Wheat final payment	-29.0	-1.775	+0.746	+0.748	+0.748	+0.748	+0.748	+0.748	+0.748
Durum initial price	+7.0	-0.266	+6.059	-0.266	-0.266	-0.266	-0.266	-0.266	-0.266
Durum final payment	-49.9	+0.160	-3.608	+0.160	+0.160	+0.160	+0.160	+0.160	+0.160
Barley initial price	+10.0	-0.564	-0.564	+3.273	-0.564	-0.564	-0.564	-0.564	-0.564
Barley off-board price	+25.2	-1.381	-1.381	+8.006	-1.381	-1.381	-1.381	-1.381	-1.381
Oats off-board price	+29.5	-0.779	-0.779	-0.779	+12.540	-0.779	-0.779	-0.779	-0.779
Rye farm price	-42.0	+0.273	+0.273	+0.273	+0.273	-25.931	+0.273	+0.273	+0.273
Flaxseed farm price	+32.2	-0.287	-0.287	-0.287	-0.287	-0.287	+12.851	-0.287	-0.287
Canola farm price	+40.5	-2.491	-2.491	-2.491	-2.491	-2.491	-2.491	+41.589	-2.491
Wheat handling cost	+2.4	-0.030	-0.046	+0.017	+0.017	+0.017	+0.017	+0.017	+0.017
Barley handling cost	+2.8	+0.008	+0.008	-0.049	+0.008	+0.008	+0.008	+0.008	+0.008
Freight rate	+42.7	-0.696	-1.153	-0.491	+0.636	+0.636	+0.636	+0.636	+0.636
Crop expenses/acre	+0.6	+0.129	-0.135	-0.179	-0.034	-0.056	+0.020	-0.116	+0.007
Wheat yield	+3.7	+4.417	-1.861	-1.861	-1.861	-1.861	-1.861	-1.861	-1.861
Durum yield	+6.4	-0.576	+13.100	-0.576	-0.675	-0.576	-0.576	-0.576	-0.576
Barley yield	-0.6	+0.195	+0.195	-1.131	+0.195	+0.195	+0.195	+0.195	+0.195
Oats yield	+0.2	-0.023	-0.023	-0.023	+0.371	-0.023	-0.023	-0.023	-0.023
Rye yield	+7.7	-0.159	-0.159	-0.159	-0.159	+15.278	-0.159	-0.159	-0.159
Flaxseed yield	+8.1	-0.333	-0.333	-0.333	-0.333	-0.333	+14.882	-0.333	-0.333
Canola yield	-1.1	+0.131	+0.131	+0.131	+0.131	+0.131	+0.131	-2.185	+0.131
Wheat marketings	-10.4	-3.308	+1.394	+1.394	+1.394	+1.394	+1.394	+1.394	+1.394
Durum marketings	+7.9	-0.160	+3.640	-0.160	-0.160	-0.160	-0.160	-0.160	-0.160
Barley marketings	+14.5	-1.393	-1.393	+8.078	-1.393	-1.393	-1.393	-1.393	-1.393
Oats marketings	+39.5	-0.229	-0.229	-0.229	+3.662	-0.229	-0.229	-0.229	-0.229
Flaxseed marketings	+33.9	-0.095	-0.095	-0.095	-0.095	-0.095	+4.312	-0.095	-0.095
Canola marketings	+21.8	-0.685	-0.685	-0.685	-0.685	-0.685	-0.685	+11.441	-0.685
Durum farm stocks	+9.6	+0.115	-2.628	+0.115	+0.115	+0.115	+0.115	+0.115	+0.115
Rye farm stocks	+113.6	+0.068	+0.068	+0.068	+0.068	-6.441	+0.068	+0.068	+0.068
Flaxseed farm stocks	-85.0	-0.298	-0.298	-0.298	-0.298	-0.298	+13.158	-0.298	-0.298
Hog inventories	+13.5	-0.005	-0.005	+0.028	-0.005	-0.005	-0.005	-0.005	-0.005
% change in acreage share		-10.451	7.637	12.373	9.904	-24.998	38.570	46.108	-7.659
1983 share (%)		39.23	4.63	13.0	3.47	1.37	1.41	7.61	29.29
1984 share forecast (%)		35.13	4.98	14.61	3.81	1.03	1.95	11.12	27.05
1984 actual share (%)		36.68	5.57	13.7	3.55	1.08	2.31	9.67	27.32
1984 acreage forecast (mil. acres)		26.49	3.75	11.02	2.87	0.78	1.47	8.38	20.4
1984 actual acreage (mil. acres)		27.66	4.20	10.35	2.68	0.82	1.74	7.29	20.6

TABLE 11 ONE STEP AHEAD FORECASTS OF 1984 ACREAGES USING THE ELASTICITIES EVALUATED AT THE 1983 CROP YEAR

Exogenous variable	% change	Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Wheat initial price	-0.9	-0.572	+0.369	+0.369	+0.369	+0.369	+0.369	+0.369	+0.369
Wheat final payment	-29.0	-2.372	+1.531	+1.531	+1.531	+1.531	+1.531	+1.531	+1.531
Durum initial price	7.0	-0.447	+9.198	-0.447	-0.447	-0.447	-0.447	-0.447	-0.447
Durum final payment	-49.9	+0.175	-3.638	+0.175	+0.175	+0.175	+0.175	+0.175	+0.175
Barley initial price	10.0	-0.669	-0.669	+4.478	-0.669	-0.669	-0.669	-0.669	-0.669
Barley off-board price	25.2	-1.462	-1.462	+9.775	-1.462	-1.462	-1.462	-1.462	-1.462
Oats off-board price	29.5	-0.531	-0.531	-0.531	+14.830	-0.531	-0.531	-0.531	-0.531
Rye farm price	-42.0	+0.643	+0.643	+0.643	+0.643	-46.322	+0.643	+0.643	+0.643
Flaxseed farm price	32.2	-0.200	-0.200	-0.200	-0.200	-0.200	+13.891	-0.200	-0.200
Canola farm price	40.5	-4.406	-4.406	-4.406	-4.406	-4.406	-4.406	+53.557	-4.406
Wheat handling cost	2.4	-0.050	-0.082	-.042	0.042	0.042	0.042	0.042	0.042
Barley handling cost	2.8	0.015	0.015	-0.097	0.015	0.015	0.015	0.015	0.015
Freight rate	42.7	-0.628	-1.127	-0.406	0.816	0.816	0.816	0.816	0.816
Crop expenses/acre	0.6	0.247	-0.234	-0.224	-0.051	0.135	0.171	-0.028	-0.196
Wheat yield	3.7	6.762	-4.365	-4.365	-4.365	-4.365	-4.365	-4.365	-4.365
Durum yield	6.4	-1.129	+23.257	-1.129	-1.129	-1.129	-1.129	-1.129	-1.129
Barley yield	-0.6	+0.296	+0.296	-1.980	+0.296	+0.296	+0.296	+0.296	+0.296
Oats yield	0.2	-0.024	-0.024	-0.024	+0.677	-0.024	-0.024	-0.024	-0.024
Rye yield	7.7	-0.337	-0.337	-0.337	-0.337	+24.255	-0.337	-0.337	-0.337
Flaxseed yield	8.1	-0.357	-0.357	-0.357	-0.357	-0.357	+25.027	-0.357	-0.357
Canola yield	-1.1	+0.290	+0.290	+0.290	+0.290	+0.290	+0.290	-3.523	+0.290
Wheat marketings	-10.4	-4.098	+2.645	+2.645	+2.645	+2.645	+2.645	+2.645	+2.645
Durum marketings	7.9	-0.303	+6.246	-0.303	-0.303	-0.303	-0.303	-0.303	-0.303
Barley marketings	14.5	-1.747	-1.747	+11.690	-1.747	-1.747	-1.747	-1.747	-1.747
Oats marketings	39.5	-0.079	-0.079	-0.079	2.232	-0.079	-0.079	-0.079	-0.079
Flaxseed marketings	33.9	-0.041	-0.041	-0.041	-0.041	-0.041	+2.909	-0.041	-0.041
Canola marketings	21.8	-1.574	-1.574	-1.574	-1.574	-1.574	-1.574	+19.116	-1.574
Durum farm stocks	9.6	+0.031	-0.624	+0.031	+0.031	+0.031	+0.031	+0.031	+0.031
Rye farm stocks	113.6	+0.068	+0.068	+0.068	+0.068	-4.578	+0.068	+0.068	+0.068
Flaxseed farm stocks	-85.0	-0.289	-0.289	-0.289	-0.289	-0.289	+20.392	-0.289	-0.289
Hog inventories	13.5	-0.004	-0.004	+0.031	-0.004	-0.004	-0.004	-0.004	-0.004
% change in acreage share		-12.792	+22.768	+14.979	+7.278	-37.927	+52.234	+63.769	-11.239
1983 share (%)		39.23	4.63	13.0	3.47	1.37	1.41	7.61	29.29
1984 share forecast (%)		34.21	5.68	14.9	3.72	0.85	2.15	12.46	26.00
1984 actual share (%)		36.68	5.57	13.7	3.55	1.08	2.31	9.67	27.32
1984 acreage forecast (mil. acres)		25.79	4.28	11.23	2.80	0.64	1.62	9.39	19.6
1984 actual acreage (mil. acres)		27.66	4.20	10.35	2.68	0.82	1.74	7.29	20.6

TABLE 12 ONE STEP AHEAD FORECASTS OF 1985 ACREAGES USING THE ELASTICITIES EVALUATED AT THE MEAN

Exogenous variable	% change	Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Wheat initial price	-4.1	-1.885	+0.794	+0.794	+0.794	+0.794	+0.794	+0.794	+0.794
Wheat final payment	34.4	+2.105	-0.888	-0.888	-0.888	-0.888	-0.888	-0.888	-0.888
Durum initial price	-7.8	+0.296	-6.752	+0.296	+0.296	+0.296	+0.296	+0.296	+0.296
Durum final payment	85.7	-0.274	+6.196	-0.274	-0.274	-0.274	-0.274	-0.274	-0.274
Barley initial price	4.5	-0.254	-0.254	+1.473	-0.254	-0.254	-0.254	-0.254	-0.254
Barley off-board price	14.2	-0.778	-0.778	+4.511	-0.778	-0.778	-0.778	-0.778	-0.778
Oats off-board price	11.7	-0.309	-0.309	-0.309	+4.974	-0.309	-0.309	-0.309	-0.309
Rye farm price	30.5	-0.198	-0.198	-0.198	-0.198	+18.831	-0.198	-0.198	-0.198
Flaxseed farm price	-1.1	+0.010	+0.010	+0.010	+0.010	+0.010	-0.439	+0.010	+0.010
Canola farm price	-6.8	+0.418	+0.418	+0.418	+0.418	+0.418	+0.418	-6.983	+0.418
Wheat handling cost	-1.2	+0.015	+0.023	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
Barley handling cost	-3.8	-0.011	-0.011	+0.066	-0.011	-0.011	-0.011	-0.011	-0.011
Freight rate	-35.7	+0.582	+0.964	+0.411	-0.532	-0.532	-0.532	-0.532	-0.532
Crop expenses/acre	7.3	+1.564	-1.647	-2.183	-0.419	-0.683	+0.240	-1.416	+0.090
Wheat yield	-6.4	-7.641	+3.219	+3.219	+3.219	+3.219	+3.219	+3.219	+3.219
Durum yield	-8.9	+0.801	-18.217	+0.801	+0.801	+0.801	+0.801	+0.801	+0.801
Barley yield	-4.0	+1.300	+1.300	-7.541	+1.300	+1.300	+1.300	+1.300	+1.300
Oats yield	-4.2	+0.483	+0.483	+0.483	-7.785	+0.483	+0.483	+0.483	+0.483
Rye yield	-5.5	+0.114	+0.114	+0.114	+0.114	-10.913	+0.114	+0.114	+0.114
Flaxseed yield	-1.4	+0.058	+0.058	+0.058	+0.058	+0.058	-2.572	+0.058	+0.058
Canola yield	-6.1	+0.725	+0.725	+0.725	+0.725	+0.725	+0.725	-12.116	+0.725
Wheat marketings	3.8	+1.209	-0.509	-0.509	-0.509	-0.509	-0.509	-0.509	-0.509
Durum marketings	-40.8	+0.824	-18.797	+0.824	+0.824	+0.824	+0.824	+0.824	+0.824
Barley marketings	-46.7	+4.488	+4.488	-26.017	+4.488	+4.488	+4.488	+4.488	+4.488
Oats marketings	-34.7	+0.201	+0.201	+0.201	-3.217	+0.201	+0.201	+0.201	+0.201
Flaxseed marketings	6.5	-0.018	-0.018	-0.018	-0.018	-0.018	+0.827	-0.018	-0.018
Canola marketings	-8.0	+0.251	+0.251	+0.251	+0.251	+0.251	+0.251	-4.198	+0.251
Durum farm stocks	-33.3	-0.400	+9.118	-0.400	-0.400	-0.400	-0.400	-0.400	-0.400
Rye farm stocks	-50.0	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030	-0.030
Flaxseed farm stocks	+233.9	+0.819	+0.819	+0.819	+0.819	+0.819	-36.208	+0.819	+0.819
Hog inventories	+0.3	-	-	+0.001	-	-	-	-	-
% change in acreage share		+4.465	-19.227	-22.900	+3.770	+20.776	-28.429	-15.515	+10.682
1984 share (%)		36.68	5.57	13.72	3.55	1.08	2.31	9.67	27.32
1985 share forecast (%)		38.32	4.50	10.58	3.68	1.30	1.65	8.17	30.24
1985 acreage forecast (mil. acres)		29.05	3.41	8.02	2.79	0.99	1.25	6.19	22.93
1985 planting intentions*(mil. acres)		28.92	4.25	11.99	4.04	1.04	1.60	6.43	19.85

*The planting intentions for barley and oats includes that acreage which is greece fed. whereas the acreage forecasts do not.

TABLE 13. ONE STEP AHEAD FORECASTS OF 1985 ACREAGES USING THE ELASTICITIES EVALUATED AT THE 1984 CROP YEAR

Exogenous variable	% change	Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Wheat initial price	-4.1	-2.692	+1.560	+1.560	+1.560	+1.560	+1.560	+1.560	+1.560
Wheat final payment	34.4	+2.081	-1.207	-1.207	-1.207	-1.207	-1.207	-1.207	-1.207
Durum initial price	-7.8	+0.640	-10.862	+0.640	+0.640	+0.640	+0.640	+0.640	+0.640
Durum final payment	85.7	-0.180	+3.102	-0.180	-0.180	-0.180	-0.180	-0.180	-0.180
Barley initial price	4.5	-0.350	-0.350	+2.198	-0.350	-0.350	-0.350	-0.350	-0.350
Barley off-board price	14.2	-1.088	-1.088	+6.840	-1.088	-1.088	-1.088	-1.088	-1.088
Oats off-board price	11.7	-0.281	-0.281	-0.281	+7.607	-0.281	-0.281	-0.281	-0.281
Rye farm price	30.5	-0.214	-0.214	-0.214	-0.214	+19.554	-0.214	-0.214	-0.214
Flaxseed farm price	-1.1	+0.015	+0.015	+0.015	+0.015	+0.015	-0.622	+0.015	+0.015
Canola farm price	-6.8	+1.322	+1.322	+1.322	+1.322	+1.322	+1.322	-12.353	+1.322
Wheat handling cost	-1.2	+0.026	+0.042	-0.021	-0.021	-0.021	-0.021	-0.021	-0.021
Barley handling cost	-3.8	-0.021	-0.021	+0.135	-0.021	-0.021	-0.021	-0.021	-0.021
Freight rate	-35.7	+0.760	+1.353	+0.493	-0.960	-0.960	-0.960	-0.960	-0.960
Crop expenses/acre	7.3	+3.458	-1.526	-3.250	-0.912	+2.973	+3.457	-0.973	-2.732
Wheat yield	-6.4	-11.777	+6.824	+6.824	+6.824	+6.824	+6.824	+6.824	+6.824
Durum yield	-8.9	+1.779	-30.164	+1.779	+1.779	+1.779	+1.779	+1.779	+1.779
Barley yield	-4.0	+2.099	+2.099	-13.202	+2.099	+2.099	+2.099	+2.099	+2.099
Oats yield	-4.2	+0.523	+0.523	+0.523	-14.197	+0.523	+0.523	+0.523	+0.523
Rye yield	-5.5	+0.177	+0.177	+0.177	+0.177	-16.173	+0.177	+0.177	+0.177
Flaxseed yield	-1.4	+0.094	+0.094	+0.094	+0.694	+0.094	-3.975	+0.094	+0.094
Canola yield	-6.1	+2.072	+2.072	+2.072	+2.072	+2.072	+2.072	-19.360	+2.072
Wheat marketings	3.8	+1.398	-0.810	-0.810	-0.810	-0.810	-0.810	-0.810	-0.810
Durum marketings	-40.8	+2.032	-34.447	+2.032	+2.032	+2.032	+2.032	+2.032	+2.032
Barley marketings	-46.7	+6.800	+6.800	-42.754	+6.800	+6.800	+6.800	+6.800	+6.800
Oats marketings	-34.7	+0.101	+0.101	+0.101	-2.731	+0.101	+0.101	+0.101	+0.101
Flaxseed marketings	6.5	-0.018	-0.018	-0.018	-0.018	-0.018	+0.740	-0.018	-0.018
Canola marketings	-8.0	+0.894	+0.894	+0.894	+0.894	+0.894	+0.894	-8.354	+0.894
Durum farm stocks	-33.3	-0.140	+2.348	-0.140	-0.140	-0.140	-0.140	-0.140	-0.140
Rye farm stocks	-50.0	-0.045	-0.045	-0.045	-0.045	+4.315	-0.045	-0.045	-0.045
Flaxseed farm stocks	233.9	+0.187	+0.187	+0.187	+0.187	+0.187	-8.350	+0.187	+0.187
Hog inventories	0.3	-	-	+0.001	-	-	-	-	-
% change in acreage share		9.652	-49.749	-32.441	+11.208	+32.535	+12.756	-23.544	+19.052
1984 share (%)		36.68	5.57	13.72	3.55	1.08	2.31	9.67	27.32
1985 share forecast (%)		40.22	2.80	9.27	3.95	1.43	2.60	7.39	32.53
1985 acreage forecast (mil. acres)		30.49	2.12	7.03	2.99	1.08	1.97	5.60	24.66
1985 planting intentions*(mil. acres)		28.92	4.25	11.99	4.04	1.04	1.60	6.43	19.85

*The planting intentions for barley and oats includes that acreages which is green fed whereas the acreage forecasts do not.

10 - CONCLUSIONS

The objective of the study was to formulate an acreage response model which recognized the finite supply of land and the joint nature of individual acreage allocation decisions. This objective has been fulfilled.

The evidence suggests that the initial price for wheat is an important input into producers' planting decisions. It follows that the announcement of this price before planting decisions are made is of benefit to producers. Moreover, given the evidence that producers respond to the initial price for wheat, it follows that the price prospects for the upcoming crop year should be the prime factors considered in setting its level.

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APPENDIX I

DERIVATION OF ELASTICITY FORMULA

BY DEFINITION

APPENDIX II

DEFINITION OF VARIABLES

ABA1 - Acreage of barley in prairie provinces.

ACP1 - Total of acreages planted to bread wheat, durum wheat, oats, barley flaxseed, rapeseed, rye and summerfallow.

ADWH1 - Acreage of durum wheat in prairie provinces.

AFL1 - Acreage of flaxseed in prairie provinces.

AOA1 - Acreage of oats in prairie provinces.

ARA1 - Acreage of canola in prairie provinces.

ARY1 - Acreage of rye in prairie provinces.

ASF1 - Acreage of summerfallow in prairie provinces.

AWH1 - Acreage of bread wheat in prairie provinces.

DLIFT - Binary Variable, for L.I.F.T. Program: 1 in 1970 otherwise 0

COST - Farm Crop Expenses.

CROW - Handling and transportation charge; farm gte to Thunder Bay

FIDWH1 - Closing farm inventories of durum in Western Canada, July 31 of the current calendar year

FIFL1 - Closing farm inventories of flaxseed in Western Canada, July 31 of the current calendar year

FIRY1 - Closing farm inventories of rye in Western Canada, July 31 of the previous calendar year

FMBA1 - Farm marketings of barley in Western Canada in the 4th quarter of the previous calendar year and the 1st quarter of the current calendar year

FMBWH1 - Farm marketings of bread wheat in Western Canada in the 4th quarter of the previous calendar year and the 1st quarter of the current calendar year

FMDWH1 - Farm marketings of durum in Western Canada in the 4th quarter of the previous calendar year and the 1st quarter of the current calendar year

FMFL1 - Farm marketings of flaxseed in Western Canada in the 4th quarter of the previous calendar year and the 1st quarter of the current calendar year

FMOA1 - Farm marketings of oats in Western Canada in the 4th quarter of the previous calendar year and the 1st quarter of the current calendar year

FMRA1 - Farm marketings of canola in Western Canada in the 4th quarte· of the previous calendar year and the 1st quarter of the current calendar year

FPFL1 - Farm price of flaxseed in Western Canada in the 1st quarter of the current calendar year

FPRA1 - Farm price of canola in Western Canada in the 1st quarer of the current calendar year

FPRY1 - Farm price of rye in Western Canada in the 2nd quarter of the previous calendar year

IHG1 - Hog inventories in the Praries

OPBA1 - Off-Board price of barley in the Praries

DPOA1 - Off-Board price of oats in the Praries

HCBA3 - Handling costs for barley in the previous crop year

HCWH3 - Handling costs for wheat in the previous crop year

TREND - Linear trend variable:1960 = 1

XFPBWH1 - Final payment for bread wheat (ICWRS) in-store Thunder Bay

XFPDWH2 - Final payment for durum wheat (1 CWAD) in-store Thunder Bay

XIPBA1 - Canadian Wheat Board initial price for no.1 feed barley in-store Thunder Bay in the 3rd quarter of the current calendar year

XIPBWH1 - Canadian Wheat Board initial price for No. 1 CWRS wheat, 13.5% protein, in-store Thunder Bay in the 3rd quarter of the current calendar year

XIPDWH1 - Canadian Wheat Board initial price for No. 1 CWAD durum, in-store Thunder Bay in the 3rd quarter of the current calendar year

YBA1 - Yield of barley in Western Canada, a 3-year moving average

YBWH1 - Yield of bread wheat in Western Canada, a 3-year moving average

YDWH1 - Yield of durum in Western Canada, a 3-year moving average

YFL1 - Yield of flaxseed in Western Canada, a 3-year moving average

YOA1 - Yield of oats in Western Canada, a 3-year moving average

YRA3 - Yield of canola in Canada, a 3-year moving average

YRY1 - Yield of rye in Western Canada, a 3-year moving average

Note: All prices are $/tonne, all acreages are 00,000 acres except where otherwise indicated and all volumes are in million tonnes.

APPENDIX III WESTERN CANADIAN CROP ACREAGE RESPONSE ELASTICITIES EVALUATED AT THE 1984 CROP YEAR

		Bread wheat	Durum wheat	Barley	Oats	Rye	Flaxseed	Canola	Summerfallow
Supply inducing prices									
Wheat:	CWB initial (Q3,t)*	0.6565	-0.3804	-0.3804	-0.3804	-0.3804	-0.3804	-0.3804	-0.3804
	CWB final payment (t-2)	0.0605	-0.0351	-0.0351	-0.0351	-0.0351	-0.0351	-0.0351	-0.0351
Durum:	CWB initial (Q3,t)	-0.0821	1.3926	-0.0821	-0.0821	-0.0821	-0.0821	-0.0821	-0.0821
	CWB final payment (t-2)	-0.0021	0.0362	-0.0021	-0.0021	-0.0021	-0.0021	-0.0021	-0.0021
Barley:	CWB initial (Q3,t)	-0.0777	-0.0777	0.4885	-0.0777	-0.0777	-0.0777	-0.0777	-0.0777
	Off-board (Q1,t-1)	-0.0766	-0.0766	0.4817	-0.0766	-0.0766	-0.0766	-0.0766	-0.0766
Oats:	Off-board (Q1,t-1)	-0.0240	-0.0240	-0.0240	0.6502	-0.0240	-0.0240	-0.0240	-0.0240
Rye:	Farm (Q2,t-2)	-0.0070	-0.0070	-0.0070	-0.0070	0.6411	-0.0070	-0.0070	-0.0070
Flaxseed:	Farm (Q1,t-1)	-0.0133	-0.0133	-0.0133	-0.0133	-0.0133	0.5650	-0.0133	-0.0133
Canola:	Farm Q1,t-1)	-0.1944	-0.1944	-0.1944	-0.1944	-0.1944	-0.1944	1.8166	-0.1944
Handling costs									
Wheat (t-1)		-0.0219	-0.0353	0.0173	0.0173	0.0173	0.0173	0.0173	0.0173
Barley (t-1)		0.0056	0.0056	-0.0354	0.0056	0.0056	0.0056	0.0056	0.0056
Freight rate (t)		-0.0213	-0.0379	-0.0138	0.0269	0.0269	0.0269	0.0269	0.0269
Crop expenses /acre (t-1)		0.4737	-0.2091	-0.4452	-0.1249	0.4073	0.4736	-0.1333	-0.3743
Yields									
Wheat (t-1,t-2,t-3)		1.8402	-1.0662	-1.0662	-1.0662	-1.0662	-1.0662	-1.0662	-1.0662
Durum (t-1,t-2,t-3)		-0.1999	3.3892	-0.1999	-0.1999	-0.1999	-0.1999	-0.1999	-0.1999
Barley (t-1,t-2,t-3)		-0.5248	-0.5248	3.3004	-0.5248	-0.5248	-0.5248	-0.5248	-0.5248
Oats (t-1,t-2,t-3)		-0.1246	-0.1246	-0.1246	3.3803	-0.1246	-0.1246	-0.1246	-0.1246
Rye (t-1,t-2,t-3)		-0.0321	-0.0321	-0.0321	-0.0321	2.9405	-0.0321	-0.0321	-0.0321
Flaxseed (t-1,t-2,t-3)		-0.0671	-0.0671	-0.0671	-0.0671	-0.0671	2.8393	-0.0671	-0.0671
Canola (t-1,t-2,t-3)		-0.3396	-0.3396	-0.3396	-0.3396	-0.3396	-0.3396	3.1757	-0.3396
Marketings									
Wheat (Q4+Q1,t-1)		0.3678	-0.2131	-0.2131	-0.2131	-0.2131	-0.2131	-0.2131	-0.2131
Durum (Q4+Q1,t-1)		-0.0498	0.8448	-0.0498	-0.0498	-0.0498	-0.0498	-0.0498	-0.0498
Barley (Q4+Q1,t-1)		-0.1456	-0.1456	0.9155	-0.1456	-0.1456	-0.1456	-0.1456	-0.1456
Oats (Q4+Q1,t-1)		-0.0029	-0.0029	-0.0029	0.0787	-0.0029	-0.0029	-0.0029	-0.0029
Flaxseed (Q4+Q1,t-1)		-0.0027	-0.0027	-0.0027	-0.0027	-0.0027	0.1139	-0.0027	-0.0027
Canola (Q4+Q1,t-1)		-0.1117	-0.1117	-0.1117	-0.1117	-0.1117	-0.1117	1.0442	-0.1117
Closing farm inventories									
Durum (t-1)		0.0042	-0.0705	0.0042	0.0042	0.0042	0.0042	0.0042	0.0042
Rye (t-2)		0.0009	0.0009	0.0009	0.0009	-0.0863	0.0009	0.0009	0.0009
Flaxseed (t-1)		0.0008	0.0008	0.0008	0.0008	0.0008	-0.0357	0.0008	0.0008
Hog inventories (Q1,t-1)		-0.0004	-0.0004	0.0025	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
Trend (t)		-1.0656	-0.6225	-0.6225	-0.7358	-0.6225	-0.6225	-0.6225	2.2654

*Q refers to the calendar quarter and t refers to the crop year

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